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EBASCO

# REM III PROGRAM

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REMEDIAL PLANNING ACTIVITIES  
AT SELECTED UNCONTROLLED  
HAZARDOUS SUBSTANCE DISPOSAL SITES



EPA CONTRACT 68-01-7250

EBASCO SERVICES INCORPORATED

NLI 001 1348

EPA WORK ASSIGNMENT NUMBER: 39-2661  
EPA CONTRACT NUMBER: 68-01-7250  
EBASCO SERVICES INCORPORATED

FINAL  
RI OVERSIGHT SUMMARY REPORT  
NL INDUSTRIES SITE  
PEDRICKTOWN, NEW JERSEY

APRIL 1990

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NL INDUSTRIES  
FINAL RI OVERSIGHT  
SUMMARY REPORT  
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## 1.0 INTRODUCTION

On May 19, 1986 the U.S. Environmental Protection Agency (USEPA) authorized Ebasco Services Incorporated (Ebasco) to provide enforcement support (oversight) to USEPA Region II for the Remedial Investigation/Feasibility Study (RI/FS) activities to be conducted by the Potentially Responsible Party (PRP) NL Industries, Inc. at the NL Industries, Inc. Site situated in Pedricktown, Salem County, New Jersey. The field oversight activities were performed in response to Work Assignment Number 39-2661 under Contract Number 68-01-7250. The objectives of the field oversight activities were to monitor the Remedial Investigation (RI) field activities for adherence to the Administrative Order on Consent (Index No. II CERCLA-60109) and the USEPA-approved project plans and to obtain split samples to verify the analytical results obtained by the PRP.

The RI field activities were conducted in two phases at the NL Industries site during 1988 (Phase I) and 1989 (Phase II) by O'Brien and Gere Engineers, Inc., the consultant to the PRP. The RI field activities included the following:

- o Bulk and containerized material inventory (Phase I)
- o Monitoring well installation (Phase I and Phase II)
- o Gamma ray logging (Phase I and Phase II)
- o Pumping test (Phase I)
- o Continuous groundwater monitoring (Phase I and Phase II)
- o Groundwater sampling (Phase I and Phase II)
- o Soil sampling (Phase I and Phase II)
- o Surface water/sediment sampling (Phase I and Phase II)
- o Slag, equipment residue, containerized solids and contained liquids sampling (Phase I)
- o Radiation survey (Phase I)

This Final RI Oversight Summary Report consists of two sections. Section 1.0 - Introduction, provides a brief description of site background information including site location, geology, history and potential onsite and offsite contamination. Section 2.0 - Summary of Remedial Investigation Activities, highlights the PRP's compliance with the Administrative Order on Consent and NL Industries' RI Work Plan and RI Site Operations Plan. The locations of split samples obtained during the field investigation are presented in the accompanying figures. Analytical results from the Phase I split sampling program are also provided. A comparative summary of the Phase II split sampling analytical results will be presented in a separate letter report upon availability of all Phase II validated data.

## 1.1 SITE BACKGROUND

### 1.1.1 Site Location

The NL Industries, Inc. site is located on Penns Grove-Pedricktown Road in Pedricktown, Oldmans Township, Salem County, New Jersey. The site, located in a predominantly rural area, covers 46 acres and contains a landfill and a former secondary lead smelting facility (O'Brien and Gere, RI Work Plan, May 1987). Railroad tracks, owned by Conrail Railroad, run through the center of the property. Figure 1-1 presents a location map for the site.

Oldmans Township is located in the northern portion of Salem County. The township is bounded on the north and west by the Delaware River, by Oldman's Creek and Gloucester County on the north and east, and Upper Penns Neck Township on the south.

The site is part of an area zoned for development as an industrial park. Agriculture is the dominant land use adjacent to the industrial area (O'Brien and Gere, RI/FS Interim Report, January 1989).

### 1.1.2 Site Geology

Previous hydrogeologic studies conducted by NL Industries have identified the existence of three "water bearing units" beneath the site. The three units consist of the water table aquifer (15 to 35 feet saturated thickness), first confined aquifer (10 to 30 feet saturated thickness), and second confined aquifer (approximately 35 feet saturated thickness) (O'Brien and Gere, Work Plan, May, 1987).

The water table aquifer directly beneath the Pedricktown facility is of the Cape May Formation and is composed mainly of fine to medium sands interbedded with silty clay lenses. Groundwater flow in the water table aquifer is generally towards the west and north (O'Brien and Gere, Work Plan, May 1987).

The Cape May Formation unconformably overlies the Raritan Formation (250 feet estimated thickness). The two confined aquifer systems, which are part of the Raritan Formation, are referred to as the first and second confined aquifers. Onsite soil boring samples show the aquifers were comprised primarily of fine to medium light colored sands interbedded with clays and silts. Separating the aquifers are extensive reddish silt and sandy clay layers. The first confining layer typically ranges in thickness from 10 to 20 feet. Soil boring logs indicate that the first confining layer beneath the site has an average thickness of 25 feet. Water level elevations collected from wells screening the first confined aquifer indicate that groundwater flow direction beneath the site is towards the north and northeast. Limited information is available concerning the second confined aquifer since only one onsite monitoring well is screened in this confining layer.



### 1.1.3 Site History

NL Industries opened the plant in 1972 to recycle lead from spent automotive batteries. The batteries were crushed, the sulfuric acid was drained, and the lead plates were removed. The lead plates were initially smelted in a rotary blast furnace, which was subsequently replaced by a rotary kiln. The rubber by-products were buried in an onsite landfill (O'Brien & Gere, Work Plan, May 1987).

The Salem County Department of Health sampled 15 residential wells in the vicinity of the facility in 1975. One well was found to have high levels of lead. Several months later, the private homes along Benjamin Green Road were connected to the municipal water line. The New Jersey Department of Environmental Protection (NJDEP) sampled onsite wells and surface water in 1976. Test results showed elevated levels of various heavy metals, primarily lead. The following year, NJDEP initiated an air monitoring program which detected elevated levels of air-borne lead, cadmium, antimony and ferrous sulfate. In 1978, NJDEP required NL Industries to replace its blast furnace; a rotary kiln was installed in its place, which reduced the number and amount of pollutants entering the air.

In May 1982, NL Industries ceased smelting operations. In October 1982, NL Industries and NJDEP entered into an Administrative Consent Order. The Administrative Consent Order called for NL Industries to conduct a remedial program, which included site soil removal and replacement, cleaning of paved plant areas, prevention of surface water run-off, closure and post-closure plans for the landfill, the installation of groundwater monitoring wells, and the installation of a groundwater abatement system.

National Smelting of New Jersey, Inc. (NSNJ) purchased the plant in February 1983 and smelting operations recommenced shortly thereafter. That same month, NSNJ, its parent company National Smelting and Refining Co. Inc., and NL Industries entered into an Amended Administrative Consent Order (AACO) with NJDEP. The AACO identified which environmental obligations were NSNJ's and which were NL Industries'.

NSNJ ceased operations in January 1984 and filed for bankruptcy in March 1984. The bankruptcy has subsequently been dismissed by the court.

The NL Industries site was placed on the EPA National Priorities List (NPL) in September 1983. The NPL is a priority-ranked list which identifies the most critical hazardous waste sites in the nation. These sites are eligible to receive federal funding for cleanup activities under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or "Superfund"). NL Industries assumed responsibility for conducting the RI/FS at the site under an Administrative Order on Consent with USEPA in April 1986.

In June 1988, O'Brien and Gere Engineers, consultants to NL Industries, initiated Phase I of a remedial investigation to determine the nature and extent of contamination present at the site. The field investigation included a waste material inventory, monitoring well installation and related testing and measurement, and the collection of environmental samples of various media contained onsite and offsite. Phase I field activities were completed in October 1988. The Phase II investigation commenced in August 1989. All field activities were completed in November 1989.

Ebasco provided enforcement support (oversight) to USEPA Region II throughout the course of the entire field program. In addition, Ebasco supported USEPA in validation of contract laboratory analyses which were performed on groundwater, soil, sediment, surface water and waste samples split with the PRP's consultant. Ebasco's role was performed in accordance with its USEPA- approved Work Plan, Field Sampling and Analysis Plan and Phase II Split Sampling Program, and NL Industries' site-specific Health and Safety Plan.

## 2.0 SUMMARY OF REMEDIAL INVESTIGATION ACTIVITIES

This section presents a summary of the Remedial Investigation (RI) field activities conducted at the site as of November 1989 by O'Brien and Gere Engineers, Inc. for NL Industries and oversight activities performed by Ebasco.

### 2.1 BULK AND CONTAINERIZED MATERIAL INVENTORY

An inventory of bulk and containerized materials was conducted during the period June 27-30, 1988 in an effort to identify and quantify the raw materials and process wastes present on the site. Stephen Holt, NL Industries' Senior Environmental Engineer and a former Facility Manager of Environmental Control and Safety, assisted in the identification of materials.

The inventory was conducted in accordance with USEPA-approved inventory protocol (O'Brien and Gere, Site Operations Plan, Appendix P, May 1988).

### 2.2 HYDROGEOLOGIC FIELD INVESTIGATIONS

Groundwater monitoring wells were installed in two phases during the RI program by John Mathes (drilling contractor). Phase I installations were performed during the periods June 21-24, 1988 and July 11-15, 1988. Phase II wells were installed during September 11-28, 1989. Figure 2-1 indicates the location of all onsite monitoring and observation wells. Offsite monitoring well locations are shown on Figure 2-2.

The monitoring well designs and specifications were developed by O'Brien and Gere's supervising geologist prior to installation. The aquifer designations and depths in which the well screens penetrate, as indicated in this Oversight Summary Report, are based on the geological assessments of the PRP and its consultants.

#### 2.2.1 Onsite Monitoring Well Installation

Monitoring well 7 was installed in June 1988 utilizing the hollow stem auger method. The well was set at a depth of 47.8 feet and screened in the bottom one-third of the water table aquifer (37-47 feet). Construction of well 7 was in accordance with USEPA-approved monitoring well installation protocol (O'Brien and Gere, Site Operations Plan, Appendix M, May 1988).

The installation of monitoring well 12 was initiated in June 1988. Problems with running sands were encountered when the driller initially used the hollow stem auger method to install this double cased monitoring well. The USEPA-approved protocol called for fluid or air rotary methods. The well bore hole had to be grouted up and sealed. Monitoring well 12 was ultimately installed in July 1988. The outer casing was placed utilizing the mud-rotary method. The drilling contractor utilized the

roller-bit method for the remainder of the well installation. Monitoring well 12 was set at a depth of 76 feet and screened the top half of the first confined aquifer (56-76 feet). The well was ultimately constructed in accordance with USEPA-approved protocol.

Monitoring well 18 was installed on September 15, 1989 during Phase II field activities. This well was not referenced in either O'Brien and Gere's Site Operations Plan or their Phase II Sampling Plan. The decision to install this well was made in the field by the PRP upon receipt of analytical results of samples obtained from monitoring well 11 during the week of August 14, 1989, indicating elevated levels of trichloroethane (TCA). Monitoring well 18 is located within the site near the western front gate (see Figure 2-1). Well 18 was set at a depth of 54 feet and screened in the bottom one-third of the water table aquifer (34-54 feet). This well was constructed in accordance with the USEPA-approved monitoring well installation protocol.

#### 2.2.2 Offsite Monitoring Well Installation

Offsite monitoring wells arranged in well clusters were installed during Phase II in September 1989. During the week of September 11, monitoring wells 14 and 15 were installed on the Hodge property. Monitoring well 14 was set at a depth of 44 feet and screened the bottom half of the water table aquifer (24-44 feet). Monitoring well 15 was set at a depth of 22 feet and screened the top half of the water table aquifer (7-22 feet). Both wells were constructed in accordance with USEPA-approved protocol.

Monitoring well 13 was installed on the Hodge property during the weeks of September 18 and 25 adjacent to monitoring wells 14 and 15. Well 13 was set in the first confined aquifer as a double cased well at a depth of 110 feet and was screened in approximately the bottom two-thirds of the first confined aquifer (90-110 feet). The well was set atop of the second confining layer. Construction of monitoring well 13 was in accordance with USEPA-approved protocol except for one minor deviation. O'Brien and Gere's Site Operation Plan calls for bentonite pellets to be used as a seal between the sand packing and gravel. The pellets were replaced with a thick slurry of bentonite to ensure a good seal on top of the sand pack.

Monitoring wells 16 and 17 were installed on the Pagnotta-Freccia property during the week of September 11. Monitoring well 16 was set at a depth of 54 feet and screened approximately the bottom one-third of the water table aquifer (34-54 feet). Monitoring well 17 was set at a depth of 21 feet and screened the top one-third of the water table aquifer (6-21 feet). Both wells were constructed in accordance with the USEPA-approved monitoring well installation protocol.

### 2.2.3 Gamma Ray Logging

Existing and recently installed monitoring wells specified by O'Brien & Gere were gamma ray logged during Phases I and II to corroborate boring log information. The logging was performed using a Johnson-Keck GR-81 Gamma Ray Logging System (W.G. Keck and Associates). The unit operates within cased or uncased wells and records the total gamma radiation emitted from stratigraphic units over a selected time interval at selected depths. Clay or clay-rich zones will typically exhibit higher radioactivity values than that of clean sand.

Ebasco personnel observed gamma ray logging of the following monitoring wells: 12 (October 1988); 8R, MD (October 1989); 3R, 11, 11R, 16, CR2, JD, OD (November 1989).

With the exception of the following two deviations, O'Brien and Gere performed all gamma ray logging in selected wells in accordance with USEPA-approved protocol (O'Brien and Gere, Site Operations Plan, Appendix N, May 1988). (1) Decontamination of the probe and cable calls for a control water rinse followed by a dilute solution of acetone swabbing and distilled water rinse upon completion of each well. This procedure was modified in the field to consist of wiping the cable and probe with a paper towel moistened with distilled water. (2) Data was recorded directly in field log book by O'Brien and Gere's site geologist rather than on specified data sheets.

It should be noted that some aspects of the USEPA-approved protocol which were implemented by O'Brien and Gere are not typically employed in gamma ray logging operations. For example, the probe was raised from each well investigated at predetermined increments rather than constant withdrawal at a fixed speed. O'Brien and Gere's technique could affect the profile definition, particularly if the probe comes to rest at a lithologic contact (e.g., sand/clay). Comparison of the boring log stratigraphy and gamma ray log data for offsite well 16 suggests a general correlation. This correlation indicates that O'Brien and Gere's technique is generally satisfactory, although the constant withdrawal method would have resulted in greater definition of vertical stratigraphic changes.

### 2.2.4 Pumping Test

O'Brien and Gere performed a short term (30 minute) pumping test on October 18, 1988 to evaluate whether hydraulic communication existed between the upper water table aquifer and the lower first confined aquifer. A centrifugal surface pump was used to pump monitoring well 12 (first confined aquifer) and a 5 psi pressure transducer was set several feet below the water level in monitoring well 7 (water table aquifer) to automatically monitor changes in water elevation. The pressure transducer was connected to an Enviro-Labs EL-200/System 17 Groundwater Monitoring System. A 15 psi pressure transducer was placed in

monitoring well 12 following the pump test and water levels were recorded during recovery in both wells (O'Brien and Gere, RI/FS Interim Report, January 1989). Ebasco did not oversee this brief pumping test since no other sampling or measurements requiring oversight were scheduled during this period.

#### 2.2.5 Continuous Groundwater Monitoring

O'Brien and Gere installed automated water level indicators on two groups of 8 wells each and monitored the wells over two 1-week periods to measure any fluctuations in groundwater elevations which might be attributable to tidal influence and/or pumping by nearby industrial users. An Enviro-Labs EL-200/System 17 groundwater monitoring system was used to conduct the program. A pressure transducer was installed in each well in the group and the recorder was set to measure water levels at 15-minute intervals. Group I wells consisted of monitoring wells 9R2, 10, 11, ID, KD, OD, PD, and BR. Group II wells included monitoring wells 9R2, 10, 12, 7, 2R2, 4R, LD and MD. Installation of the monitoring system occurred on October 17 and 18, 1988. Group I wells were monitored from October 19 through 26. Group II wells were monitored during the second week of the program (O'Brien and Gere, RI/FS Interim Report, January 1989).

Ebasco conducted oversight activities during the first day of system installation. O'Brien and Gere set up the electrical cables to be run from NL Industries' trailer near the landfill to the first group of monitoring wells. No problems were encountered during this initial activity. Ebasco did not oversee the actual monitoring phase of the program because of its automated feature.

### 2.3 GROUNDWATER SAMPLING PROGRAM

Groundwater was sampled in two phases to determine the degree of temporal variance which may exist beneath the site and to confirm the concentrations of contaminants detected at selected wells.

#### 2.3.1 Onsite Wells

Phase I sampling of 28 monitoring wells occurred during August 15-19, 1988. Figure 2-3 indicated the onsite monitoring well sample locations. O'Brien and Gere evacuated at least three well volumes and measured pH, conductivity, turbidity and temperature prior to sampling each well. Table 2-1 presents well purge and water quality data measured by O'Brien and Gere. Most samples required filtration due to the high suspended solids content of the groundwater. Onsite groundwater split samples were taken by Ebasco at the following five wells: 7, 11, 12, 4R and ER2.

O'Brien and Gere analyzed Phase I monitoring well samples for antimony, arsenic, cadmium, chromium, copper, lead, selenium, chloride, sulfate, gross alpha/beta, total organic carbon and total organic halogen. Selected monitoring well samples were also analyzed for silver, beryllium, mercury, nickel, zinc, thallium, cyanide and radioisotopes. Table 2-2 presents comparative analytical results from the O'Brien and Gere and Ebasco split samples. Figure 2-3 also provides Phase I onsite groundwater analytical results for selected metals. There was general agreement between the trace metals/sulfate results for the five onsite split samples.

With the exception of the following deviation, Phase I sampling activities were performed in accordance with the USEPA-approved sampling protocol (O'Brien and Gere, Site Operations Plan, Appendix I, May 1988). O'Brien and Gere did not cool Phase I samples to 4°C upon collection nor prior to shipment. This may have resulted in some loss of the volatile component of Total Organic Carbon (TOC) content in the affected samples. As indicated in Table 2-2, the concentrations detected by O'Brien and Gere in five of the six split samples were lower than those measured in Ebasco's samples which were cooled per the approved protocol.

Phase II sampling of 32 monitoring wells occurred during August 14-16, 1989. Onsite groundwater split samples were taken by Ebasco at the following six monitoring wells during Phase II: 12, 18, 1R, CR2, KS, and SD. Figure 2-4 indicates the onsite monitoring well sample locations. O'Brien and Gere measured pH, conductivity, and temperature prior to sampling each well. Table 2-3 presents water quality data measured by O'Brien and Gere.

All Phase II onsite monitoring well samples are to be analyzed for lead, cadmium, and sulfate. Selected samples are also to be analyzed for gross alpha/beta, TCL organics, nickel, antimony, silver, arsenic, chromium, copper, zinc, radium, and selected radioisotopes.

With the exception of the following deviation, Phase II sampling activities were performed in accordance with the USEPA-approved protocol. The PRP did not collect liquids generated during the decontamination procedure for disposal with landfill leachate during the first two days of sampling. The liquids were allowed to pour directly onto the ground.

### 2.3.2 Offsite Wells

Phase I sampling of 6 residential wells occurred during August 17-18, 1988. O'Brien and Gere measured pH, conductivity, and temperature prior to taking unfiltered samples from each well. O'Brien and Gere analyzed Phase I residential well samples for antimony, arsenic, cadmium, chromium, copper, lead, selenium,

sulfate, chloride, gross alpha/beta, total organic carbon and total organic halogen. One offsite residential well groundwater split sample was taken by Ebasco (see Figure 2-2). The sample was collected by O'Brien and Gere directly from an outside spigot. All Phase I sampling was performed in accordance with USEPA-approved protocol.

Phase II sampling of 9 residential wells occurred during August 14-16, 1989. One of these wells was sampled by O'Brien and Gere at the request of the resident (see Figure 2-2). O'Brien and Gere measured pH prior to sampling each well. Ebasco obtained one private well split sample. All Phase II residential well samples are to be analyzed for lead and cadmium.

Sampling of the 5 offsite monitoring wells installed during Phase II took place during October 16 and 17, 1989. Ebasco collected split samples from monitoring wells 13 and 17 (see Figure 2-2). Phase II offsite monitoring well samples will be analyzed for lead, cadmium, arsenic, chromium, sulfate, and gross alpha/beta.

Phase II sampling of offsite residential and monitoring wells was performed in accordance with USEPA-approved protocol except for the following deviation: The groundwater sample collected from monitoring well 17 was not filtered due to the limiting capacity of the equipment to process water with a high concentration of suspended solids. Ebasco's Field Operations Leader and a representative of the PRP agreed to ship the samples from well 17 unfiltered and unpreserved and have the O'Brien and Gere and Contract Laboratory Program (CLP) laboratories filter the samples upon receipt. This deviation is expected to have a minor impact on the analytical results.

## 2.4 SOIL SAMPLING PROGRAM

Surface soil sampling was conducted in two phases. The first phase was performed during September 12-16, 1988 in an effort to determine the degree and extent of onsite and offsite soil contamination. O'Brien and Gere collected composite samples at 23 onsite locations and 49 offsite locations to represent strata of 0"-3", 3"-6", 6"-12", and 12"-18" below grade.

During Phase I, Ebasco split a total of 22 soil samples with O'Brien and Gere. Eight of these split samples were taken from onsite locations, with the remaining 14 split samples obtained offsite. Figures 2-5 and 2-6 indicate the locations and depths of onsite and offsite soil split samples.

O'Brien and Gere analyzed all Phase I soil samples collected from 0 to 3 inches and 3 to 6 inches below grade for total lead (O'Brien and Gere, RI/FS Interim Report, January 1989). Deeper samples were analyzed by O'Brien and Gere for lead when the



3"-6" strata had a total lead concentration of greater than 200 ppm. In addition, approximately 10% of the Phase I soil samples were analyzed for antimony, arsenic, cadmium, copper, chromium, lead, selenium, tin and zinc. Table 2-4 presents comparative analytical results from the O'Brien and Gere and Ebasco Phase I split samples.

O'Brien and Gere deviated from the USEPA-approved soil sampling protocol in two instances during Phase I sampling. The field team utilized a line method of sampling in heavily wooded areas instead of the preferred three meter circle method (O'Brien and Gere, Site Operations Plan, Appendix C, May 1988). NL Industries' Work Plan (O'Brien and Gere, May 1987, page 13) specified that the line method was to be used when a three meter circle cannot physically be utilized around the gridpoint. This is considered to be an acceptable alternative. Occasionally, the lexan tube sample containers were not capped upon removal from the subgrade and were often placed into the whirlpak bags either uncapped or with duct tape at the tube ends. Trace metals that are the contaminants of concern are relatively immobile in soil and are not expected to go undetected as a result of uncapped tube sample containers. Duct tape is not expected to introduce any significant cross contamination since the latex adhesive is predominantly organic in nature. All other sampling activities were in accordance with approved procedures.

The second phase of soil sampling was performed on August 17, 1989 to verify elevated lead concentrations detected at six locations during Phase I sampling. Figure 2-7 indicates the locations and depths of Phase II soil samples. Thirteen composite samples were collected by O'Brien and Gere at seven locations, including one sample obtained at a location designated 44A (approximately 10 feet from Location 44). All samples will be analyzed for total lead. In addition, the 18"-24" sample from Location 217 will be analyzed for antimony, arsenic, and selenium.

Phase II soil sampling was performed in accordance with USEPA-approved protocol. O'Brien and Gere extruded, composited, and split two soil samples with Ebasco in the field (inside the USEPA van utilized by the Ebasco Field Operations Leader) rather than at O'Brien and Gere's laboratories as suggested in the Site Operations Plan. This alternate approach was deemed acceptable by USEPA and Ebasco since it satisfied the "controlled ambient conditions" criteria as stated in the approved protocol. This modification afforded Ebasco's Field Operations Leader the opportunity to observe the compositing and homogenization of soil samples. In addition, the resulting transfer of CLP documentation responsibility for these two split samples from O'Brien and Gere to Ebasco improved the quality assurance of this effort.

## 2.5 SURFACE WATER/SEDIMENT SAMPLING PROGRAM

Surface water and sediment sampling was performed in two phases by O'Brien and Gere. Phase I sampling was performed to characterize the quality of surface water and sediment on the site and upgradient and downgradient of the site. O'Brien and Gere collected surface water samples at five locations on August 19, 1988, surface water/sediment samples at nine locations on September 13, 1988, and marsh sediment samples at eight locations during September 12-13, 1988.

During Phase I, one marsh sediment sample, three stream sediment samples and three surface water sample were split by Ebasco. Figure 2-8 indicates the locations of surface water/sediment split samples.

O'Brien and Gere analyzed all Phase I surface water and sediment samples for lead. Tables 2-5 and 2-6 present comparative analytical results from the O'Brien and Gere and Ebasco Phase I split samples for surface water and sediments, respectively.

O'Brien and Gere deviated from the USEPA-approved protocol during the stream sediment sampling. All samples were kept at ambient conditions regardless of grain size. The approved protocol requires that fine grained, cohesive samples were to be kept at less than 0°C. Additionally, the samples were homogenized and composited in the field rather than in O'Brien and Gere's laboratory (O'Brien and Gere, Site Operations Plan, Appendix H, May 1988). No observations were made as to whether the stream sediment samples consisted of fine-grained or course-grained material. O'Brien and Gere's assumption that the sediments were course-grained, and thus did not require freezing, should not have significantly affected the sample characteristics as being representative of surface sediments. Similarly, compositing under controlled conditions, such as a laboratory, is not as critical for surface sediments as it would be when attempting to establish the vertical distribution of contaminants from samples taken at greater depths. All other sampling activities were in accordance with approved procedures.

An expanded second phase of surface water/sediment sampling was performed during October 16-17, 1989 in an effort to better quantify lead concentrations in the vicinity of the site. Surface water and sediment samples were collected by O'Brien and Gere at 23 locations. Sediment samples were collected from each location for each of the following depths: 0"-3", 3"-6", 6"-12", and 12"-18". Ebasco obtained surface water split samples at four locations during Phase II. Fifteen sediment samples collected by O'Brien and Gere at five sample locations from three depths (0"-3", 3"-6", 6"-12") were subsequently split at O'Brien and Gere's Syracuse laboratory. Phase II surface

water/sediment split sample locations are indicated on Figure 2-9. Each sample will be analyzed for total lead. In addition, the 0"-3" sediment sample from Location 802 will be analyzed for antimony, arsenic, cadmium, chromium, copper, selenium, tin and zinc.

With the exception of one deviation, Phase II sampling was performed in accordance with USEPA-approved protocol. The first four sediment samples collected by O'Brien and Gere were not immediately frozen with dry ice and might possibly have experienced minor redistribution of water content, depending on the nature and degree of stratification, while the boat transporting the samples was moved from one location to the other. All sediment samples were cooled upon return to the trailer, a common field practice. The one to two hours elapsed time is not considered significant.

## 2.6 SLAG, EQUIPMENT RESIDUE, CONTAINERIZED SOLIDS AND CONTAINED LIQUIDS SAMPLING PROGRAM

Materials that could not be identified in the bulk and containerized material inventory (discussed in Section 2.1) were sampled during the Phase I investigation. Slag and equipment residue were also sampled during Phase I and subsequently analyzed to determine their potential contribution to suspected contamination at the site. O'Brien and Gere collected the following samples on October 3-4, 1988: 3 composite slag samples, 8 equipment residue samples, 29 containerized solid samples, and 21 contained liquids samples.

Ebasco split the following solid and liquid samples during Phase I of the investigation: three contained liquid samples, four containerized solid samples, two equipment residue samples and one slag sample. Figure 2-10 indicates the locations where the above split samples were obtained.

O'Brien and Gere analyzed all slag, equipment residue, bulk and containerized solids samples for total lead. In addition, unknown bulk and containerized solids samples were analyzed for antimony, arsenic, cadmium, chromium, copper, selenium, tin, and zinc. The EP toxicity test was also performed on all slag samples and analyzed for arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver. All contained liquid samples were analyzed for pH, lead and total organic carbon. In addition, selected liquid samples were analyzed for gross alpha and beta radionuclides and total organic halogen. Tables 2-7, 2-8, 2-9, and 2-10 present comparative analytical results from the O'Brien and Gere and Ebasco split samples.

O'Brien and Gere deviated from the USEPA-approved Site Operations Plan in the performance of three aspects of the sampling protocol. The following is a description of these deviations which resulted in Ebasco's issuance of Field Change Requests (FCRs). Also included is an assessment of the significance of these deviations.

- o Liquid samples were not immediately cooled to 4°C. O'Brien and Gere did not always have ice available on site resulting in samples being kept at ambient conditions for up to two days. Though the lead content of the samples was probably not affected, this deviation may have resulted in a loss of volatile components of samples analyzed for total organic carbon and total organic halogen.
- o Gloves were not changed prior to collection of each sample. O'Brien and Gere personnel only changed gloves upon each entrance to Zone 1 or 2 (O'Brien and Gere, Site Operations Plan, Figure 6, May 1988) facilitating potential cross contamination of samples. High metal concentrations are anticipated throughout these areas and probably did not significantly affect the quality assurance of these samples.
- o O'Brien and Gere implemented an abbreviated procedure for sampling equipment. Only a nitric acid rinse and a distilled water rinse were applied each time. In addition, the sampling equipment was not air-dried nor foil-wrapped. Elimination of the organic (acetone/methanol and hexane) rinses probably did not affect the results since metals were the only species analyzed.

## 2.7 LANDFILL LEACHATE SAMPLING PROGRAM

During Phase II O'Brien and Gere sampled leachate from the primary and secondary sumps of pumphouse A and pumphouse B at the landfill (O'Brien and Gere, Phase II Sampling Plan, June 1989). Ebasco split both primary sump samples with O'Brien and Gere on August 15, 1989.

Each leachate sample will be analyzed for pH, conductivity, gross alpha and gross beta radiation, Target Compound List (TCL) metals, and cyanides. Additionally, the A Primary and A Secondary sump samples will be analyzed for total organic carbon and total organic halogen, while the B Primary and B Secondary sump samples will be analyzed for TCL organics.

The PRP was in full compliance with the USEPA-approved leachate sampling protocol (O'Brien and Gere, Site Operations Plan, Appendix L, May 1988).

## 2.8 RADIATION SURVEY PROGRAM

A radiation survey program was conducted by O'Brien and Gere in June 1988 to identify possible radiation sources that may be present at the site. The survey consisted of a walk-through with a hand-held radiation survey meter. The meter used was a Ludlum Measurements, Inc. Model 3 Radiation Survey meter with a Model 44-9 detector. The survey included the buildings, storage areas, process areas and onsite soil sampling locations.

All detected radiation levels, with the exception of one area, were well below the 2 milliRems/hour threshold for site evacuation. The area which exceeded the allowable threshold was located on the plant's main floor, adjacent to the spiral classifier, in the northern portion of the facility. The spiral classifier was used in the water removal phase of the decasing process to remove dense material which could not be pumped. The actual radiation level detected in this area, was not reported to the Ebasco Field Operations Leader during the survey nor included in NL Industries' RI/FS Interim Report (O'Brien and Gere, January 1989).

The radiation survey was conducted in accordance with USEPA-approved protocol (O'Brien and Gere, Site Operations Plan, Appendix A, May 1988).

TABLE 2-1

ONSITE MONITORING WELL PURGE AND WATER QUALITY DATA  
PHASE I

Well I.D.	Depth (ft)	Static Water Level (ft)	Approx. Total Volume Purged (gal)	Water Quality		
				pH	Conduc- tivity (umho/cm)	Temp (°C)
HD	41.50	13.19	55.3	4.2	265	20
HS	26.44	13.29	25.7	3.8	300	20
QS	15.73	6.49	18.0	4.2	335	21
11	53.99	5.25	95.3	5.2	4500	30
PD	29.75	6.43	45.6	5.5	2300	22
5R	18.96	6.72	23.9	4.3	600	23
BR	38.85	5.04	66.13	5.7	2000	25
4R	23.89	11.49	24.25	4.4	800	22
10	72.42	17.96	106.52	4.9	550	-
3R	34.79	11.40	45.75	3.6	260	-
12	78.0	14.86	123.5	5.5	90	21
7	49.38	11.49	74.1	4.4	1000	23
2R2	22.10	7.24	29.0	6.6	5500	25
LD	18.71	7.63	21.6	4.2	330	26
CR2	33.51	12.53	41.0	5.7	110	-
J12	27.44	7.46	39.0	4.3	510	23
KS	17.78	5.89	23.2	2.9	5000	18
KD	27.47	6.15	41.7	2.5	12,000	17
ID	35.41	10.37	48.9	4.0	120	20
RD	36.01	9.87	51.1	5.0	200	28
9R2	67.70	23.16	87.1	4.7	80	12
MD	19.69	6.29	26.2	5.5	4000	11
MS	12.11	6.43	11.1	4.0	700	-
ND	24.20	7.25	33.1	3.4	270	20
SD	28.96	7.21	42.5	3.7	20,000	20
NS	16.82	8.35	16.5	3.6	710	21
OD	37.15	7.98	57.0	4.0	10,000	22
SS	16.77	6.24	20.5	4.1	3,800	21

NL INDUSTRIES OVERSIGHT  
GROUNDWATER ANALYSES  
PHASE I

AUGUST, 1988

EBAS=Ebasco Services Inc.

OBG=O'Brien &amp; Gere Engineers

## LOCATIONS:

	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-GW-01	T0003	NL-GW-02	T0007	NL-GW-03	T0010
	(OBG WELL 11)	(OBG WELL 11)	(OBG WELL 4R)	(OBG WELL 4R)	(OBG WELL 7)	(OBG WELL 7)
Well Depth/Aquifer:	53.9'/WATER TABLE		23.8'/WATER TABLE		49.3'/WATER TABLE	

## INORGANICS/ORGANICS(mg/L)

Sulfate	2489.9	2760	648.8	553	924.3	647
Chloride	166.1	170	28.4	5	13.5	7
Total Organic Carbon	85.8	22	22.9	8	16.9	7
Total Organic Halogens	2470	1750	7.0	26.5	15.0	<10

## RADIONUCLIDES:

(pCi/L)

Gross Alpha	14.6+/-12.0 J	<10	3.9+/-4.0 J	<3	22.9+/-4.0	<6
Gross Beta	12.7+/-11.9 J	<50	15.4+/-3.6	13.0+/-8.0	17.4+/-4.7	<20.0

## TRACE METALS:

(mg/L)

Antimony	.06 U	<.003	.06 U	<.003 J	.06 U	<.03
Arsenic	.02 R	.03 R	.02 U	.001	.002 U	<.001
Beryllium	.0005 U	.003	.001 B	NA	.012	NA
Cadmium	.068	.134	.041	.047	.024	.031
Chromium	.01 U	.005 J	.01 U	.013	.01 U	.014
Copper	.042	.042	.010 B	<.02	.104	.113
LEAD	.035 R	.006 J	.011 R	.031	.0094 R	.008 J
Mercury	.0002 U	<.0002	.002 U	NA	.0002 U	NA
Nickel	.020 B	.063	.128	NA	.052	NA
Selenium	.020 U	<.02 R	.02 R	<.02	.02 U	<.02
Silver	.01 U	<.01	10	NA	.010	NA
Thallium	.002 U	.001	.002 U	NA	.002 U	NA
Zinc	.173 JN	.297	.214 JN	NA	.505 JN	NA
Cyanide	NA	NA	NA	NA	NA	NA

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# TABLE 1-2 Continued

NL INDUSTRIES OVERSIGHT

GROUND WATER ANALYSES

AUGUST, 1988

PHASE I

	EBAS NL-GW-04 (OBG WELL 12)	OBG T0011 (OBG WELL 12)	EBAS NL-GW-05 (OBG WELL CR2)	OBG T0016 (OBG WELL CR2)	EBAS NL-GW-0F-01 (RESIDENTIAL WELL)	OBG T0031 PW7
Well Depth/Aquifer:	78.1'/FIRST CONFINED		33.5'/WATER TABLE		UNKNOWN/WATER TABLE	
INORGANICS/ORGANICS(mg/l)						
Sulfate	20.6	4	<5	4	39.7	35
Chloride	10.2	3	<10	<1	21.2	25
Total Organic Carbon	14.5	1	7.4	7	3.8	5
Total Organic Halogens	<5.0	<10	41.2	<10	42	<10
Radionuclides:						
(pCi/L)						
Gross Alpha	3 U	<2	3.0 U	<1	3.0+/-2.1 UJ	<1
Gross Beta	4.4+/-1.7 J	2.6+/-1.6	4.0 U	<2	4.8+/-2.6 J	4.8+/-1.6
Trace Metals:						
(MG/L)						
Antimony	.06 U	<.003	.06 U	<.003	.06 U	<.003
Arsenic	.002 R	.002	.001 U	<.001	.001 U	.003
Beryllium	.0005 U	NA	.001 B	NA	.002 B	NA
Cadmium	.005 U	<.001	.005 U	<.001	.005 U	<.001
Chromium	.01 U	.001 J	.011	.01	.01 U	.007 J
Copper	.01 U	<.02	.170	<.02	.425 J	<.02
LEAD	.788 R	.027 J	.0047 R	.028 J	.054 R	.005 J
Mercury	.0002 U	NA	.0002 U	NA	.0002 U	NA
Nickel	.015 U	NA	.015 U	NA	.015 U	NA
Selenium	.002 R	<.002	.002 U	<.002	.002 U	<.02
Silver	.01 U	NA	.01 U	NA	.01 U	NA
Thallium	.002 U	NA	.002 U	NA	.002 U	NA
Zinc	.039 JN	NA	.085 J	NA	.231 J	NA
Cyanide	.01 U	NA	.01 U	NA	NA	NA



TABLE 2-2 Continued

DATA REPORTING QUALIFIERS:

- U: INDICATES COMPOUND WAS ANALYZED FOR, BUT NOT DETECTED.
- NA: INDICATES ANALYTE WAS NOT TESTED FOR.
- R: INDICATES VALUE WAS REJECTED. GENERALLY THE RESULT OF LAB OR FIELD BLANK CONTAMINATION.
- J: INDICATES AN ESTIMATED VALUE.
- B: INDICATES ANALYTE WAS FOUND IN THE BLANK AS WELL AS THE SAMPLE.
- N: INDICATES SPIKE SAMPLE RECOVERY IS NOT WITHIN CONTROL LIMITS.
- NV: Sample has been not validated.

TABLE 2-3

## ONSITE MONITORING WELL WATER QUALITY DATA (PHASE II)

Well I.D.	pH	Conductivity ( $\mu$ MHO/cm)	Temp (°C)
QS	4.8	600	22
NS	3.9	4,800	20
ND	3.8	3,400	18
2R2	8.7	13,000	17
MS	4.1	700	20
MD	4.9	1,400	19
LD	3.5	120	20
3R	3.1	270	17
4R	3.6	650	18
7	5.4	1,200	20
1R	4.1	4,400	22
12	5.7	125	-
HS	4.4	220	18
HD	10	12,500	18
OD	4.1	2,000	20
PD	5.7	1,600	20
ID	4.0	170	20
JD	3.6	700	20
KS	4.2	-	20
KD	3.4	500	20
RD	5.9	240	22
RS	6.1	170	22
SS	5.4	1,800	26
SD	2.3	24,000	26
CR2	5.7	130	19
BR	4.1	310	19
11	5.7	4,100	20
9R2	5.0	100	18
10	4.0	440	18

TABLE 2-4

NL INDUSTRIES OVERSIGHT  
SURFACE SOIL ANALYSES

September, 1988

EBAS=Ebasco Services Inc.  
OBG=Obrien & Gere Engineers

## LOCATIONS:

INORGANICS (mg/kg)	EBAS NL-SO-01	OBG T0062 (0-3 in)	EBAS NL-SO-02	OBG T0070 (0-3 in)	EBAS NL-SO-03	OBG T0079 (3-6 in)	EBAS NL-SO-04	OBG T0113 (3-6 in)	EBAS NL-SO-05	OBG T0149 (0-3 in)	EBAS NL-SO-06	OBG T0158 (3-6 in)	EBAS NL-SO-07	OBG T0162 (3-6 in)	EBAS NL-SO-08	OBG T0166 (3-6 in)
LEAD	34.1	29	29.8	33	34.2	33.1	120	132	781	740	254	226	5040	2840	28700	12300
Trace Metals:																
Antimony	15.9 J	NA	13 J	NA	13.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	6.7 J	NA	5.1 J	NA	13.3 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	0.8 U	NA	0.7 U	NA	0.7 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	19.2	NA	19.1	NA	6.4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	12.6	NA	8	NA	13.8	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	0.5 J	NA	0.4 J	NA	0.4 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	921 J	NA	876 J	NA	644 J	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	41.5	NA	30	NA	39.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

## LOCATIONS:

INORGANICS (mg/kg)	EBAS NL-SO-09	OBG T0181 (0-3 in)	EBAS NL-SO-10	OBG T0186 (3-6 in)	EBAS NL-SO-11	OBG T0201 (0-3 in)	EBAS NL-SO-12	OBG T0217 (0-3 in)	EBAS NL-SO-13	OBG T0364 (3-6 in)	EBAS NL-SO-14	OBG T0246 (3-6 in)	EBAS NL-SO-15	OBG T0253 (0-3 in)	EBAS NL-SO-16	OBG T0269 (0-3 in)
LEAD	66.3	60	44.6	45	48.9	46.3	40.9	48.1	16.2	23.1	45.1	43.3	106	108	172	145
Trace Metals:																
Antimony	NA	NA	NA	NA	NA	<20	NA	<20	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	6.3	NA	5.7	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	<1	NA	<1	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	5.8	NA	7.9	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	5.6	NA	6.8 J	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	<.5	NA	<.5 J	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	<80	NA	<80	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	14.8	NA	16.7	NA	NA	NA	NA	NA	NA	NA	NA

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TABLE 2-4 Continued  
SURFACE SOIL ANALYSES

LOCATIONS:

EBAS	OBG	EBAS	OBG	EBAS	OBG	EBAS	OBG	EBAS	OBG	EBAS	OBG
NL-SO-17	T0281	NL-SO-18	T0289	NL-SO-19	T0297	NL-SO-20	T0326	NL-SO-21	T0334	NL-SO-22	T0342

INORGANICS (mg/kg)	(0-3 in)	(0-3 in)	(0-3 in)	(0-3 in)	(3-6 in)	(3-6 in)	(3-6 in)
--------------------	----------	----------	----------	----------	----------	----------	----------

LEAD	128	121	920	538	28.9	25	51.9	38.1	293	226	47.0	40.2
------	-----	-----	-----	-----	------	----	------	------	-----	-----	------	------

Trace Metals:

Antimony	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tin	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

TABLE 2-5  
NL INDUSTRIES OVERSIGHT  
SURFACE WATER ANALYSES

August, September 1988

EBAS=Ebasco Services Inc.

OBG=Obrien & Gere Engineers

INORGANICS (MG/L)	Locations					
	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-SW-01	NO. 6	NL-SW-02	NO. 5	NL-SW-03	NO. 9
Antimony	.06 U	NA	NA	NA	NA	NA
Arsenic	.01 U	NA	NA	NA	NA	NA
Beryllium	.0005 U	NA	NA	NA	NA	NA
Cadmium	.005 U	NA	NA	NA	NA	NA
Chromium	.01 U	NA	NA	NA	NA	NA
Copper	.022 B	NA	NA	NA	NA	NA
LEAD	.018 R	.011	.02 R	.025	2.03	1.98
Mercury	.0002 U	NA	NA	NA	NA	NA
Nickel	.035 B	NA	NA	NA	NA	NA
Selenium	.002 U	NA	NA	NA	NA	NA
Silver	.01 U	NA	NA	NA	NA	NA
Thallium	.002 U	NA	NA	NA	NA	NA
Zinc	.088 J	NA	NA	NA	NA	NA

TABLE 2-6  
NL INDUSTRIES OVERSIGHT  
SEDIMENT ANALYSES

August, September, 1988

EBAS=Ebasco Services Inc.  
OBG=Obrien & Gere Engineers

	LOCATIONS:							
	EBAS	OBG	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-SD-01	T0093	NL-SD-02	T0100	NL-SD-03	T0133	NL-SD-04	T0135
INORGANICS	(MARSH)	(0-6 in)	(STREAM)	809	(STREAM)	806	(STREAM)	805
(MG/KG)								
LEAD	676	1190	1143	552	42	<5	333	4350

TABLE 2-7  
NL INDUSTRIES OVERSIGHT  
SLAG MATERIALS

October, 1988

EBAS=Ebasco Services Inc.  
OBG=Obrien & Gere Engineers

LOCATIONS:

EBAS OBG  
NL-SL-01 T0383

EBAS OBG  
NL-SL-01 T0445

INORGANICS (MG/KG)

	EBAS	OBG
LEAD	89,000	NA

EP TOX Metals: (MG/L)

	EBAS	OBG
Arsenic	NA	<.15
Barium	NA	.135
Cadmium	NA	.094
Chromium	NA	<.01
Lead	NA	.137
Mercury	NA	<.0002
Selenium	NA	<.35
Silver	NA	<.01

TABLE 2-8  
NL INDUSTRIES OVERSIGHT  
EQUIPMENT RESIDUE

October, 1988

EBAS=Ebasco Services Inc.

OBG=O'Brien & Gere Engineers

LOCATIONS:

EBAS      OBG  
NL-EQ-01   T0388

EBAS      OBG  
NL-EQ-02   T0395

INORGANICS (mg/kg)

LEAD	292,000	237,000	332,000	283,000
------	---------	---------	---------	---------



TABLE 2-9  
NL INDUSTRIES OVERSIGHT  
SOLID WASTE MATERIALS      October, 1988

EBAS=Ebasco Services Inc.

OBG=Obrien & Gere Engineers

	LOCATIONS:					
	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-SX-01	T0391	NL-SX-02	T0390	NL-SX-03	T0396
INORGANICS (MG/KG)						
LEAD	308,000	***	320,000	176,000	249,000	280,000

\*\*\*

Value not shown in interim report.

NL INDUSTRIES OVERSIGHT  
LIQUID WASTE MATERIALS

October, 1988

EBAS=Ebasco Services Inc.  
OBG=Obrien & Gere Engineers

LOCATIONS:

EBAS OBG  
NL-LX-01 T0426

EBAS OBG  
NL-LX-02 T0423

EBAS OBG  
NL-LX-03 T0431

INORGANICS (mg/L)

	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-LX-01	T0426	NL-LX-02	T0423	NL-LX-03	T0431
Total Organic Carbon	NA	107	NA	12	6.0	7
Total Organic Halogens	NA	33	NA	NA	59	20

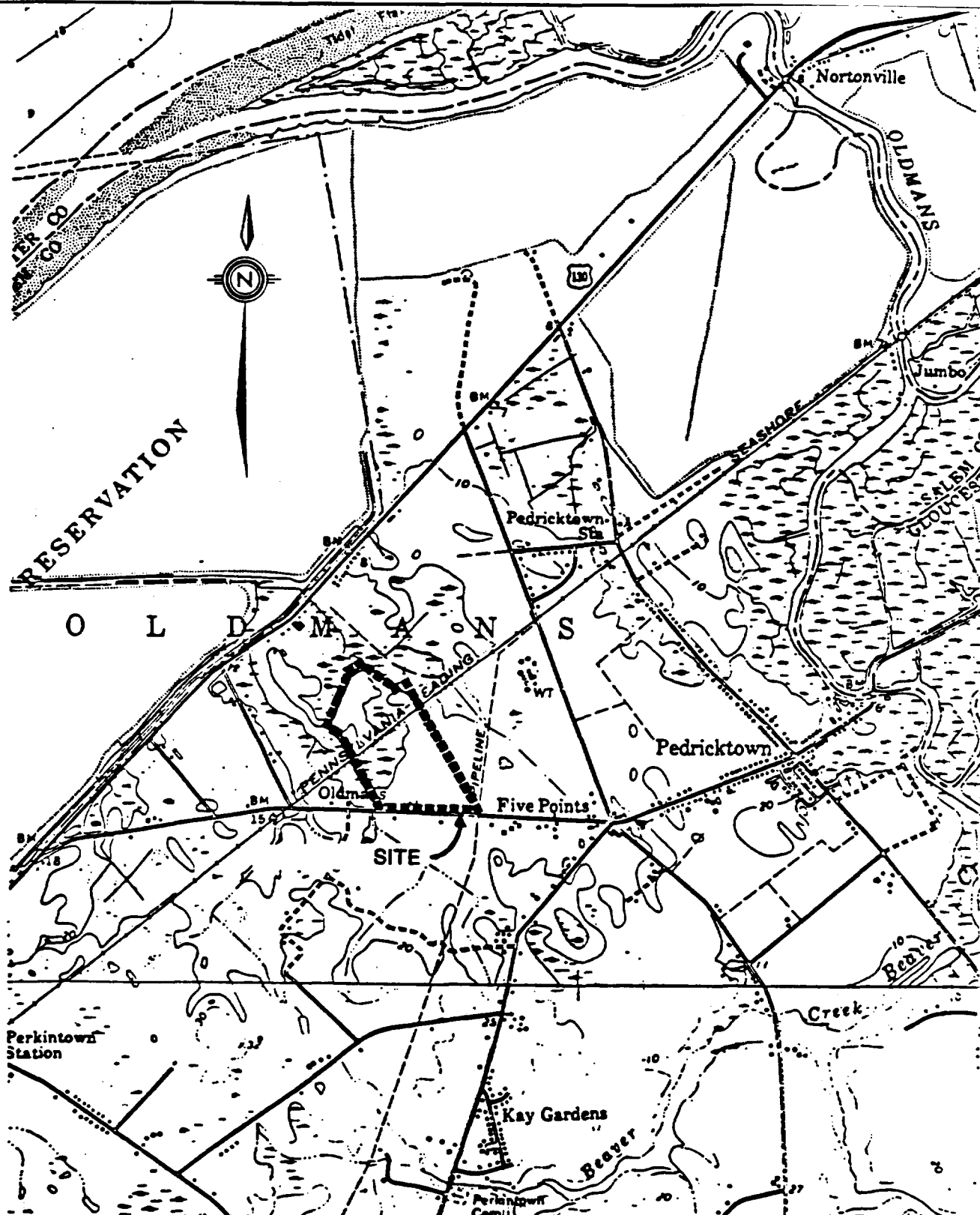
RADIONUCLIDES  
(pCi/L)

	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-LX-01	T0426	NL-LX-02	T0423	NL-LX-03	T0431
Gross Alpha	NA	<40	NA	NA	<2.4	<10
Gross Beta	NA	240+/-80	NA	NA	<3.9	<30

	EBAS	OBG	EBAS	OBG	EBAS	OBG
	NL-LX-01	T0426	NL-LX-02	T0423	NL-LX-03	T0431
TOTAL LEAD (mg/L)	10.9J	14.5	1.82J	1.62	4.60J	3.39

NV: DATA NOT VALIDATED.  
NA: NOT ANALYZED.

*These should  
have been considered*



**NOTE:**

MAP ADAPTED FROM U.S.G.S.  
MARCUS HOOK, PA. - PENNS GROVE, N.J.  
QUADRANGLES AND O'BRIEN & GERE  
WORK PLAN, 1987

**U.S. ENVIRONMENTAL PROTECTION  
AGENCY**

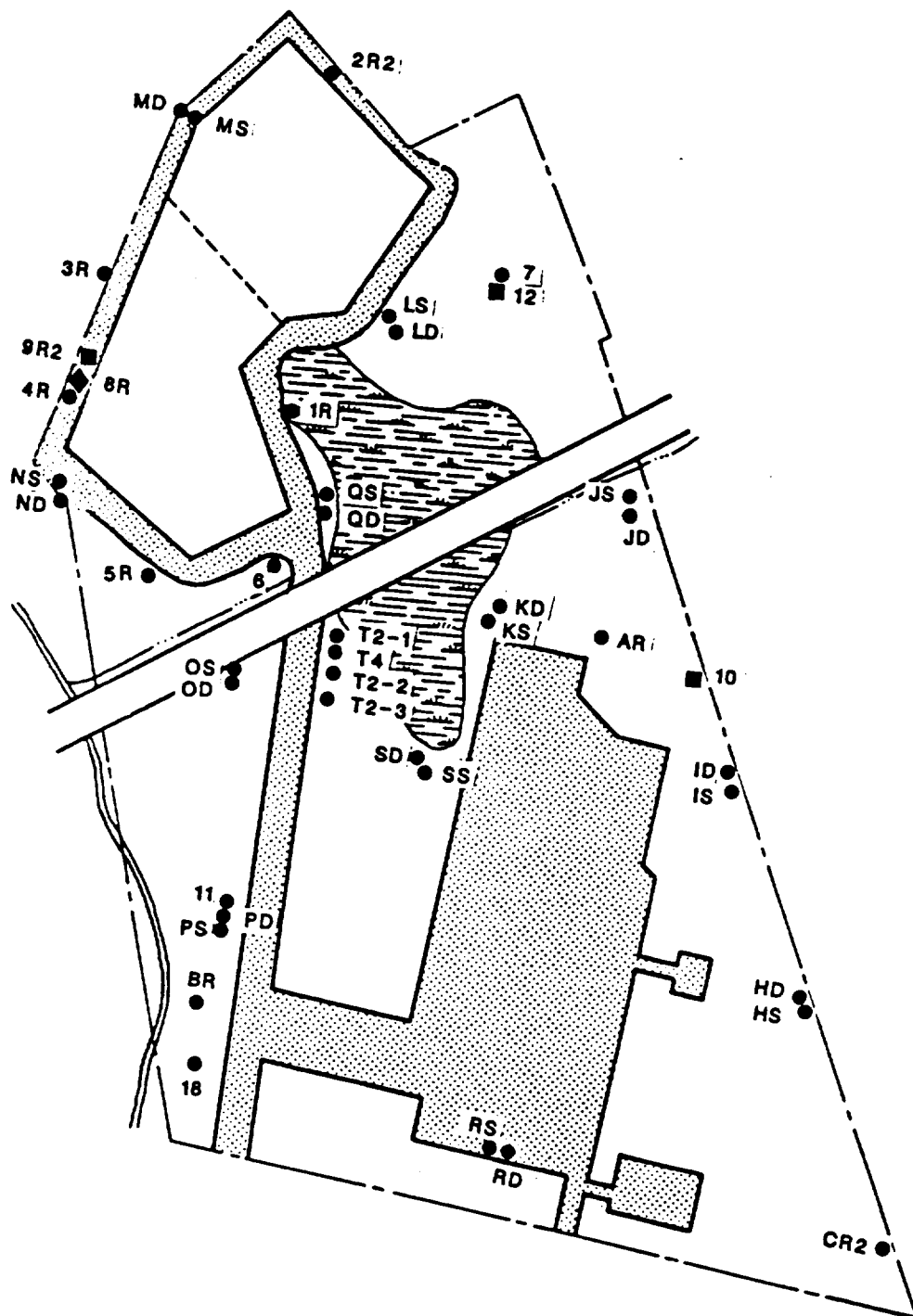
**NL INDUSTRIES, INC.**

**FIGURE 1-1**





**SITE LOCATION**

**EBASCO SERVICES INCORPORATED**

NLI 001 1382



**LEGEND :**

-  BUILDINGS, ROADS, OR  
PAVED AREAS (APPROX.)
-  WATER TABLE AQUIFER WELL
-  FIRST CONFINED AQUIFER WELL
-  SECOND CONFINED AQUIFER WELL

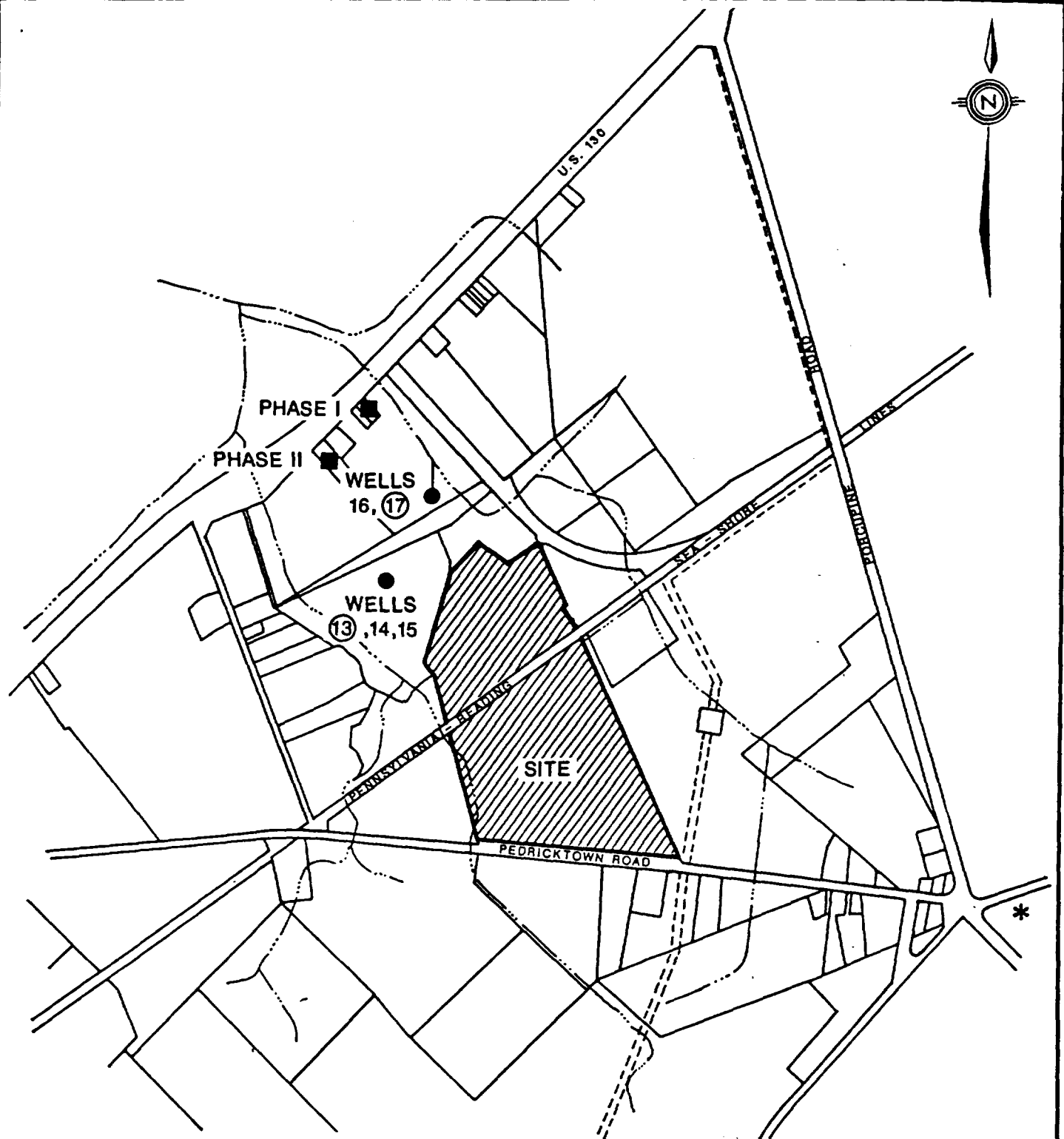
**U.S. ENVIRONMENTAL PROTECTION  
AGENCY**

**NL INDUSTRIES, INC.**

**FIGURE 2-1**

**ONSITE MONITORING WELLS**

**EBASCO SERVICES INCORPORATED**



**LEGEND:**

- MONITORING WELL CLUSTER
- MONITORING WELL SPLIT SAMPLE LOCATION
- RESIDENTIAL WELL SPLIT SAMPLE LOCATION
- \* RESIDENTIAL WELL NON-SPLIT SAMPLE LOCATION - NOT INCLUDED IN NL INDUSTRIES PHASE II SAMPLING PROGRAM

U.S. ENVIRONMENTAL PROTECTION  
AGENCY

NL INDUSTRIES, INC.

FIGURE 2-2

OFFSITE MONITORING WELLS

EBASCO SERVICES INCORPORATED

NLI 001 1384



4R

PHASE "B" LANDFILL

PHASE "A" LANDFILL

RAILROAD

11

7

12

#7

EBAS		OBG	
As	.002R	As	<.001
Cd	.024	Cd	.031
Cr	.01U	Cr	.014
Pb	.0004R	Pb	.008
Se	.02R	Se	<.02

#12

EBAS		OBG	
As	.002R	As	.002
Cd	.006U	Cd	<.001
Cr	.01U	Cr	.001
Pb	.788R	Pb	.027
Se	.002R	Se	<.002

#CR2

EBAS		OBG	
As	.001U	As	<.001
Cd	.005U	Cd	<.001
Cr	.011	Cr	.01
Pb	.0047R	Pb	.028
Se	.002U	Se	<.002

#11

EBAS		OBG	
As	.02R	As	.03
Cd	.068	Cd	.134
Cr	.01U	Cr	.005
Pb	.035R	Pb	.008
Se	.02R	Se	<.02

#4

EBAS		OBG	
As	.02R	As	.001
Cd	.041	Cd	.047
Cr	.01U	Cr	.013
Pb	.011R	Pb	.031
Se	.02R	Se	<.02

CR2

LEGEND:

EBAS EBASCO  
OBG O'BRIEN AND GERE

As ARSENIC  
Cd CADMIUM  
Cr CHROMIUM  
Pb LEAD  
Se SELENIUM  
R REJECTED VALUE  
U ANALYZED FOR, BUT NOT DETECTED

CONCENTRATIONS  
IN PPM

200 0 200 400  
SCALE IN FEET

BUILDINGS, ROADS, OR  
PAVED AREAS (APPROX.)

MARSHLAND

WELL ID NUMBER

NON-SPLIT SAMPLE LOCATION

SPLIT SAMPLE LOCATION

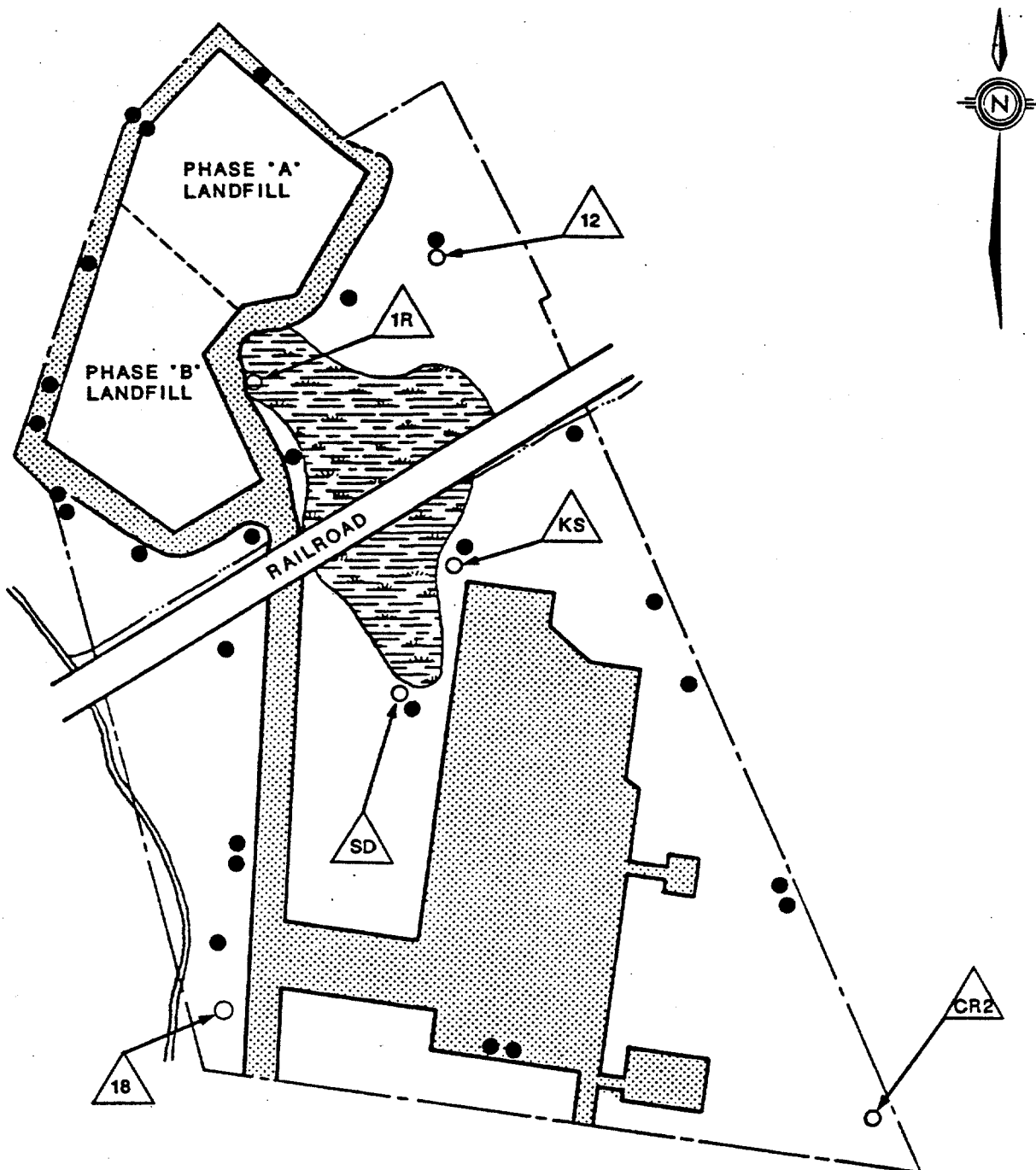
U.S. ENVIRONMENTAL PROTECTION  
AGENCY

NL INDUSTRIES, INC.

FIGURE 2-3

ONSITE  
MONITORING WELL  
SAMPLE LOCATIONS  
PHASE I

EBASCO SERVICES INCORPORATED



**LEGEND:**



BUILDINGS, ROADS, OR  
PAVED AREAS (APPROX.)



MARSHLAND



WELL ID NUMBER



NON-SPLIT SAMPLE LOCATION



SPLIT SAMPLE LOCATION

200 0 200 400

SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION  
AGENCY

NL INDUSTRIES, INC.

FIGURE 2-4

ONSITE  
MONITORING WELL SAMPLE LOCATIONS  
PHASE II

EBASCO SERVICES INCORPORATED

NLI 001 1386



NL-SO-01  
0"-3" (OBG T0062)

NL-SO-02  
0"-3" (OBG T0070)

NL-SO-05  
0"-3" (OBG T0149)

NL-SO-10  
3"-6" (OBG T0186)

NL-SO-09  
0"-3" (OBG T0181)

NL-SO-08  
3"-6" (OBG T0166)

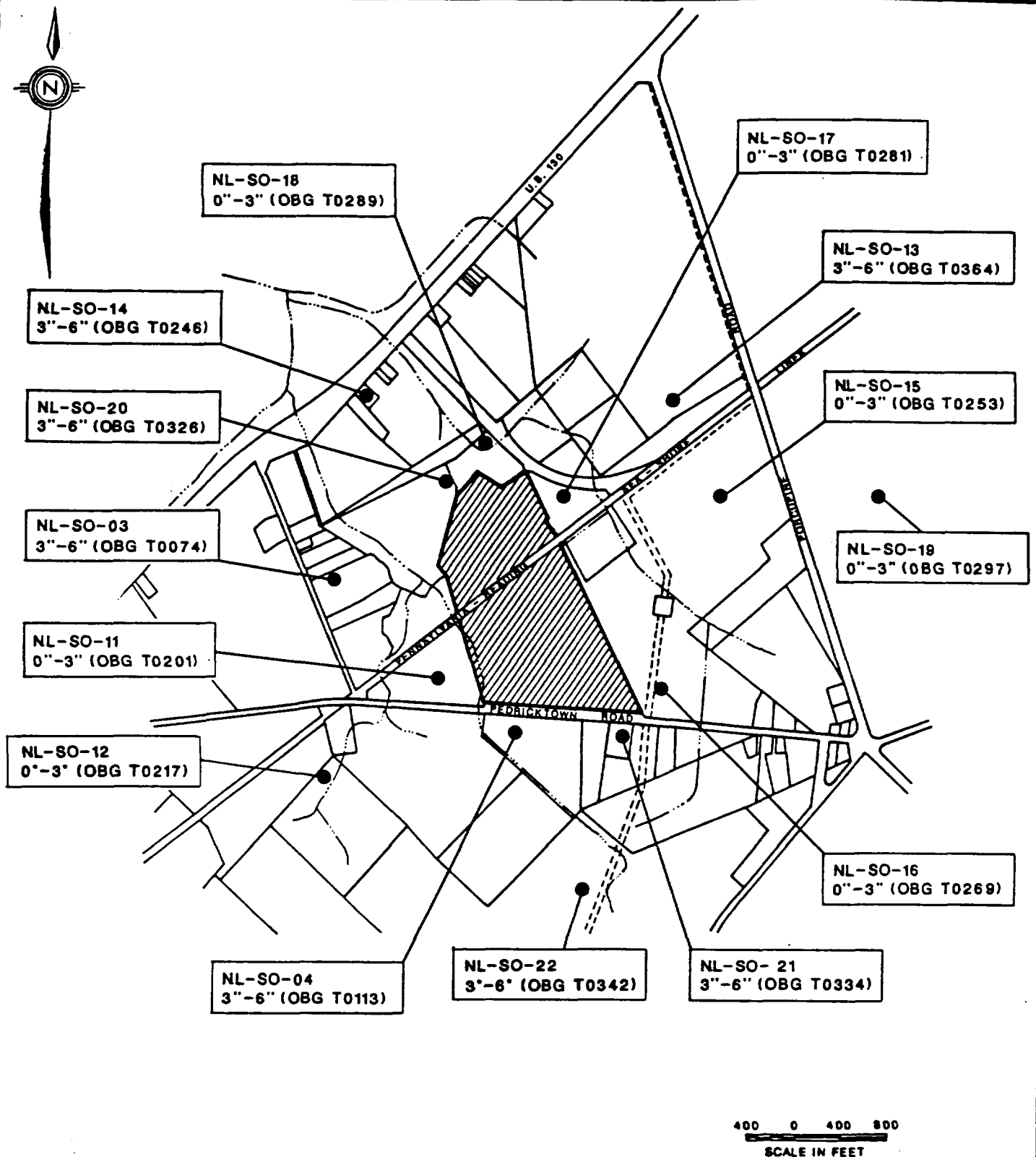
NL-SO-07  
3"-6" (OBG T0162)

NL-SO-06  
3"-6" (OBG T0158)

200 0 200 400  
SCALE IN FEET

U.S. ENVIRONMENTAL PROTECTION AGENCY
NL INDUSTRIES, INC.
FIGURE 2-5
ONSITE SURFACE SOIL SPLIT SAMPLE LOCATIONS PHASE I
EBASCO SERVICES INCORPORATED





**LEGEND:**



**SITE**

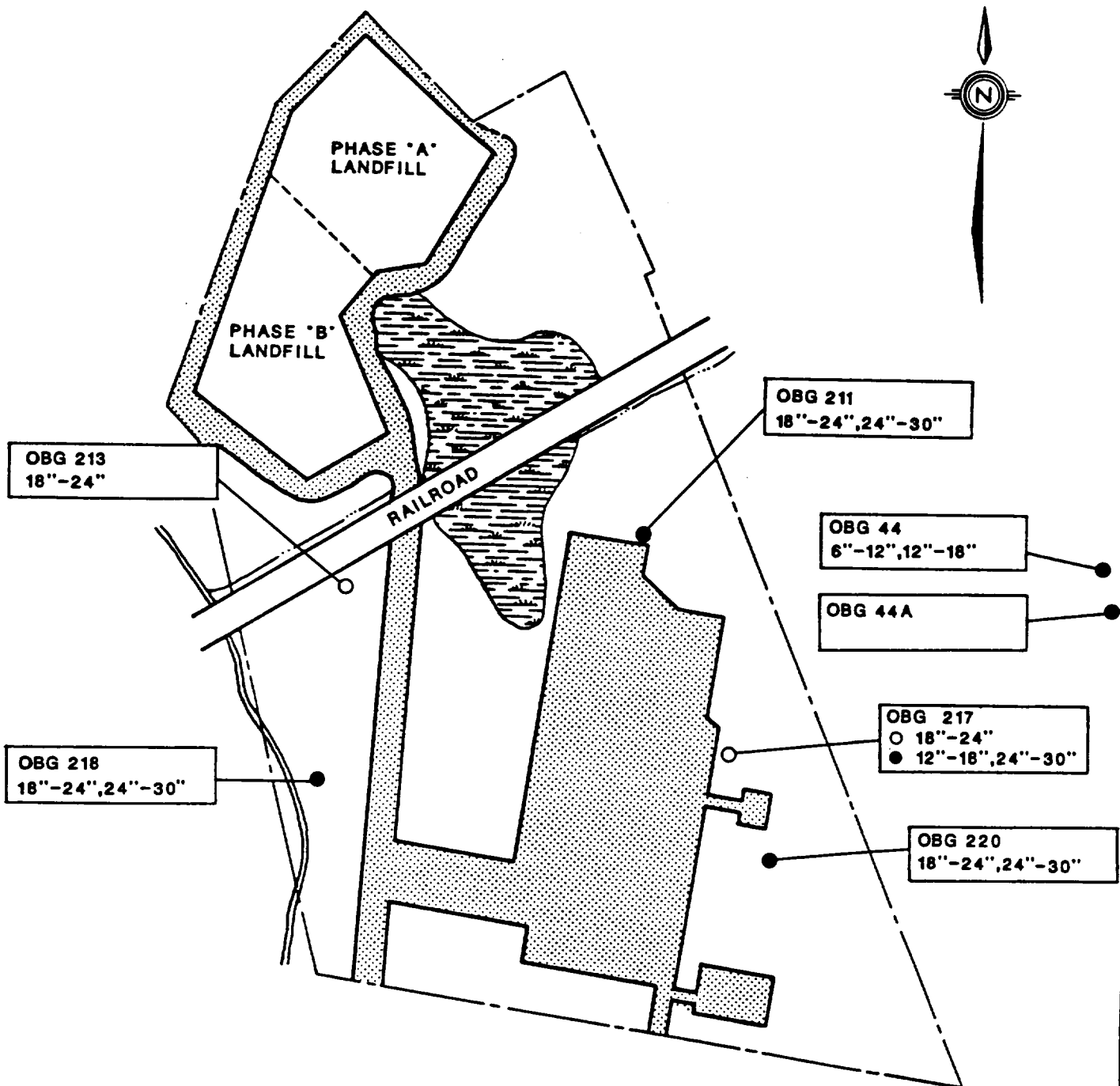
**U.S. ENVIRONMENTAL PROTECTION  
AGENCY**

**NL INDUSTRIES, INC.**

**FIGURE 2-6**

**OFFSITE  
SURFACE SOIL SPLIT SAMPLE LOCATIONS  
PHASE I**

**EBASCO SERVICES INCORPORATED**



**LEGEND:**



BUILDINGS, ROADS, OR  
PAVED AREAS (APPROX.)



MARSHLAND



NON-SPLIT SAMPLE LOCATION



SPLIT SAMPLE LOCATION



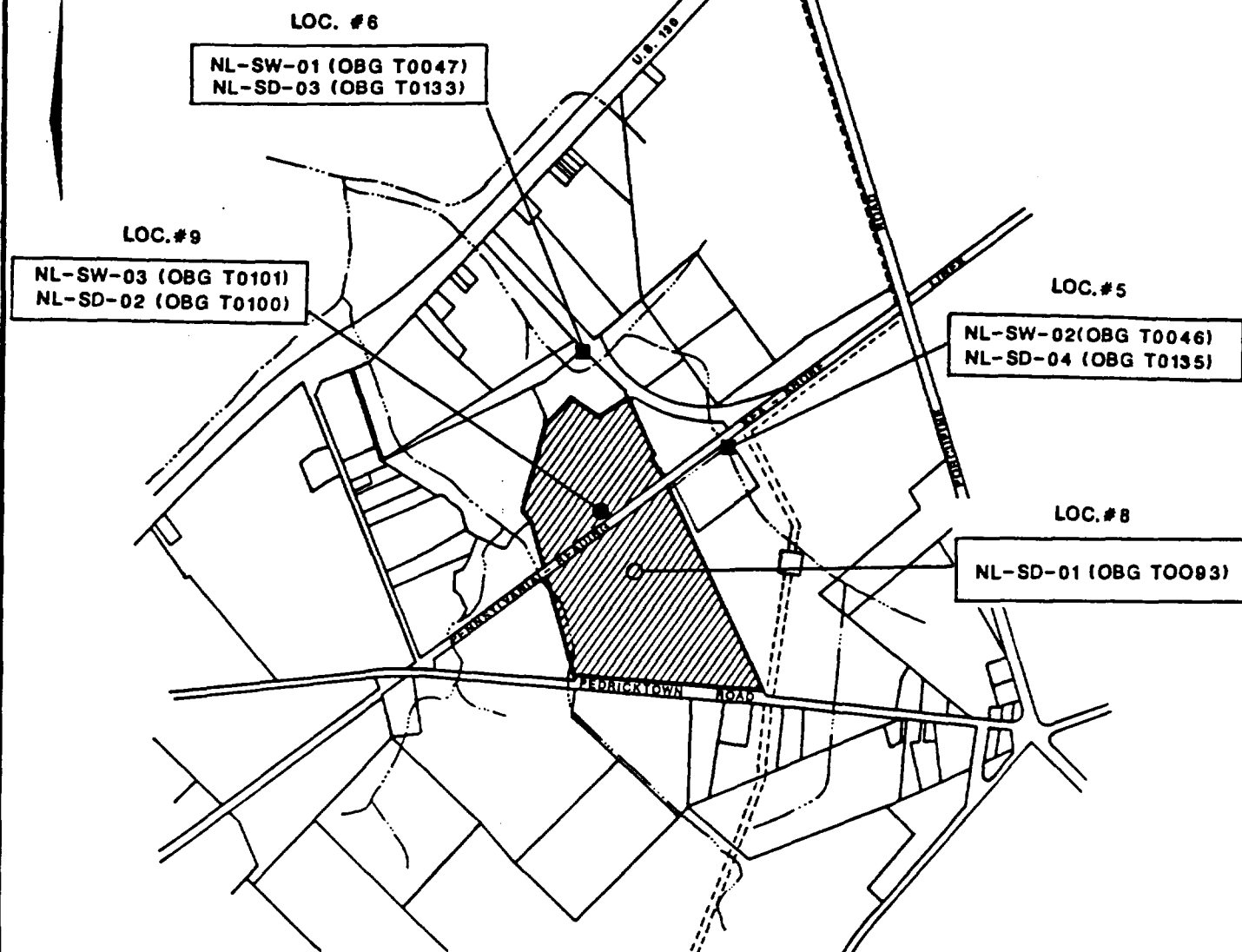
U.S. ENVIRONMENTAL PROTECTION  
AGENCY

NL INDUSTRIES, INC.

FIGURE 2-7

SURFACE SOIL  
SAMPLE LOCATIONS  
PHASE II

EBASCO SERVICES INCORPORATED



**LEGEND:**

- ONSITE MARSH SEDIMENT SAMPLE LOCATION
- ONSITE SURFACE WATER & SEDIMENT SAMPLE LOCATION
- OFFSITE SURFACE WATER & SEDIMENT SAMPLE LOCATION
- ▨ SITE

400 0 400 800  
SCALE IN FEET

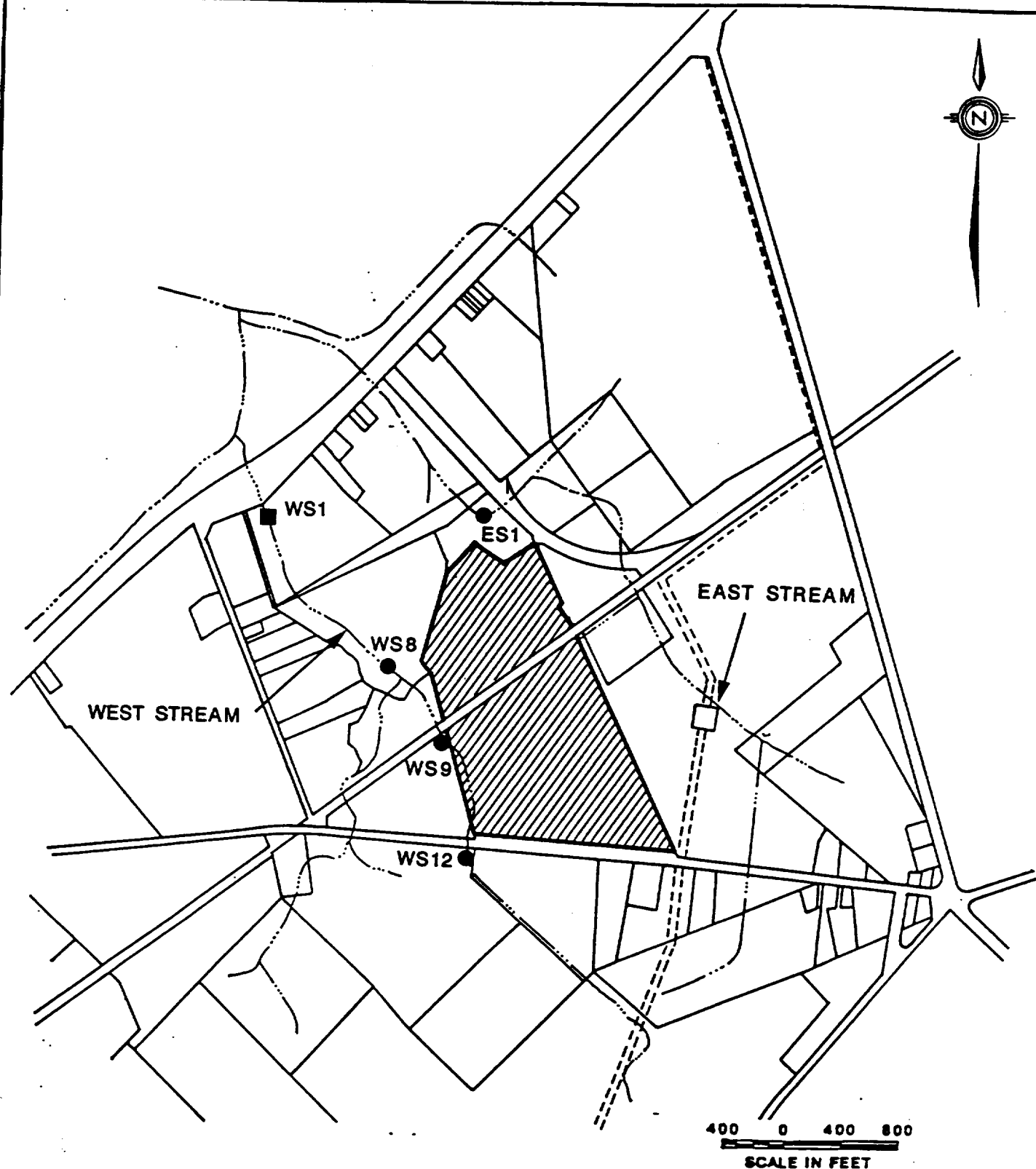
**U.S. ENVIRONMENTAL PROTECTION  
AGENCY**

**NL INDUSTRIES, INC.**

**FIGURE 2-8**

**SURFACE WATER/ SEDIMENT  
SPLIT SAMPLE LOCATIONS  
PHASE I**

**EBASCO SERVICES INCORPORATED**



**LEGEND:**



**SITE**



**SEDIMENT SAMPLES (MULTIPLE DEPTH) LOCATION**



**SURFACE WATER AND SEDIMENT  
SAMPLES (MULTIPLE DEPTH) LOCATION**

**U.S. ENVIRONMENTAL PROTECTION  
AGENCY**

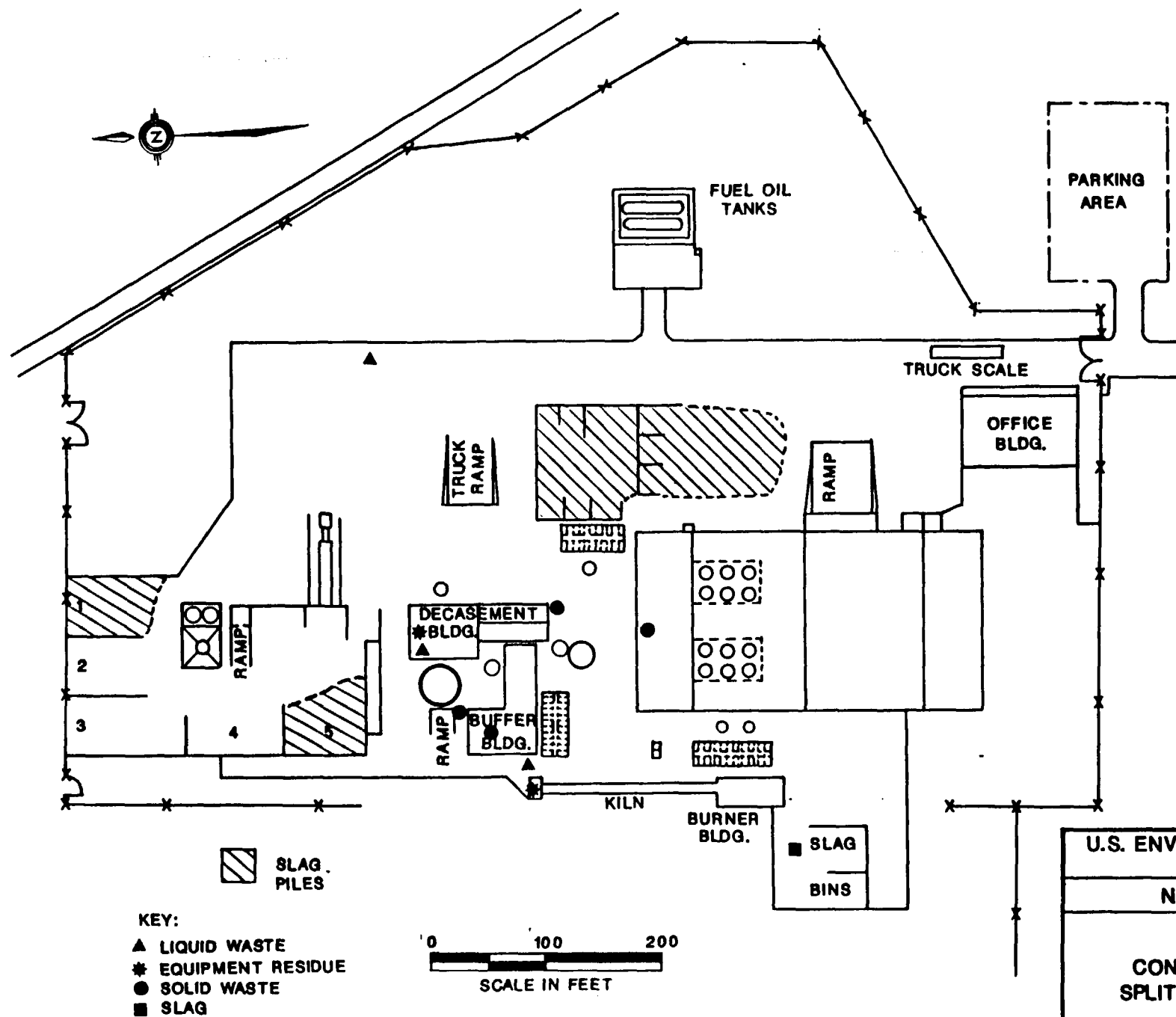
**NL INDUSTRIES, INC.**

**FIGURE 2-9**

**SURFACE WATER/ SEDIMENT  
SPLIT SAMPLE LOCATIONS  
PHASE II**

**EBASCO SERVICES INCORPORATED**

**NLI 001 1391**



U.S. ENVIRONMENTAL PROTECTION  
AGENCY

NL INDUSTRIES INC.

FIGURE 2-10  
CONTAINERIZED WASTE  
SPLIT SAMPLE LOCATIONS

EBASCO SERVICES INCORPORATED

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